

moray offshore renewables ltd

Environmental Statement

Technical Appendix 7.3 G - Habitat Regulations Appraisal:
Marine Mammals

Telford, Stevenson, MacColl Wind Farms
and associated Transmission Infrastructure
Environmental Statement



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This document was produced by Natural Power on behalf of Moray Offshore Renewables Ltd



Document Owner		Nancy McLean			
Document Status		Final			
File Name					
Revision	Date	Description	Originated By	Checked By	Approved By
A1	May 2012	For review	SJC	CJP	NM
A2	June 2012	Final	SJC	CJP	NM

APPENDIX 7.3 G

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1. Introduction

In 2009, Moray Offshore Renewables Limited (MORL) was awarded a Zone Development Agreement by The Crown Estate to develop Zone 1 of the nine UK offshore wind Round 3 zones (henceforth referred to as MORL Zone).

The MORL Zone is located in the outer Moray Firth on the Smith Bank approximately 22 km (12 nm) from the Caithness coastline. The water depths range from 37 - 57 m (20-31 ftm). The zone itself covers 520 km² (281 nm²).

Detailed analysis of the zone identified two separate development areas, the eastern development area (EDA) and the western development area (WDA) and it was decided to develop the EDA first. Within the EDA, three offshore wind farm sites are being proposed:

- Telford Offshore Wind Farm (Telford), located in the north-east of the EDA covers 97 km² (52 nm²).
- Stevenson Offshore Wind Farm (Stevenson), located in the north-west of the EDA.
- MacColl Offshore Wind Farm (MacColl), located in the south of the EDA).

Consent for offshore transmission infrastructure (includes both offshore and onshore infrastructure), required to transfer the power from the three sites to either an onshore or offshore connection to the National Grid, is also being proposed.

1.1 Purpose of this report

The purpose of this report is to begin the process of HRA following the relevant guidance and good practice in assessing the potential impacts which may arise during the construction of the proposed MacColl, Stevenson and Telford offshore wind farms, either singly or in combination with other developments upon potentially vulnerable European (Natura) Sites.

The aim of this report is to:

- 1) to identify those relevant Natura Sites which may include marine mammals as features and which may be sensitive and vulnerable to potential effects arising from the construction, operation or decommissioning of the proposed project;
- 2) Identify effects associated with the construction, operation or decommissioning of the proposed projects; assess their effects upon the relevant Natura sites, either alone or in combination with other projects or plans, and consider whether these effects may be significant.
- 3) Consider in detail any impacts identified as potentially having a significant effect on the features of the relevant Natura sites in respect of their conservation objectives, structure and function.

Information provided here will be based on that presented in the Telford, Stevenson and MacColl Wind Farms and Associated Infrastructure ES and in Technical Appendices 4.4 A and 7.3 A-F. MORL intend to install a met mast on a 4.5 m monopile foundation within the Stevenson site over a two week period during 2012, and will take the opportunity to participate in surveys designed to reduce some of the conservative assumptions made within the assessment methodology described with the six Technical Appendices A-F, which are detailed in Table 7.3.11 of Chapter 7.3. These surveys, and how it is hoped they will enable refinement of the assumptions, are detailed in 7.3.7.26 to 7.3.7.30 in Chapter 7.3. It is anticipated that the assessment contained within this appendix will also be revisited once construction parameters have been finalised and amendments made were necessary. There is also the potential for mitigation measures that may have developed to commercial viability for the deep, tidal waters of the Moray Firth to be incorporated in any revised modelling.

1.2 Proposed projects

Zone 1 is located in the outer Moray Firth on the Smith Bank approximately 22 km (12 nm) from the Caithness coastline. The water depths range from 37 - 57 m (20-31 ftm). The zone itself covers 520 km² (281 nm²).

Detailed analysis of the zone identified two separate development areas, the eastern development area (EDA) and the western development area (WDA) and it was decided to develop the EDA first. Within the EDA, three offshore wind farm sites are being proposed:

- Telford Offshore Wind Farm (Telford), for which consents for construction and operation are being applied for by Telford Offshore Wind Limited. Telford is located in the north-east of the EDA. The site covers 97 km² (52 nm²) and has water depths of approximately 39 - 57 m (21-31 ftm).
- Stevenson Offshore Wind Farm (Stevenson), for which consents for construction and operation are being applied for by Stevenson Offshore Wind Limited. Stevenson is located in the north-west of the EDA. The site covers 77 km² (42 nm²) and has water depths of approximately 37 - 53 m (20-29 ftm).
- MacColl Offshore Wind Farm (MacColl), for which consents for construction and operation are being applied for by MacColl Offshore Wind Limited. MacColl is located in the south of the EDA. The site covers 125 km² (68 nm²) and has water depths of approximately 37 - 57 m (20 - 31 ftm).

Consent for transmission infrastructure (TI) required to transfer the power from the three sites to an onshore connection to the National Grid, is also being proposed.

The onshore connection would be to the Peterhead Power Station. The proposed export cable route to the onshore connection has a landfall at Fraserburgh Beach. The onshore transmission route to Peterhead via

Fraserburgh Beach would be 28.6 km in length. These assets will ultimately be transferred to and operated by an Offshore Transmission Owner (OFTO).

The proposed wind farms, Telford, Stevenson and MacColl, will each have a maximum capacity of 500 MW. A summary of the infrastructure within each site is provided below:

- Wind turbines rated between 3.6-7 / 8 MW;
- Wind turbine substructures and foundations, of which there are two potential concepts
 - Jacket substructure with pin pile foundations
 - Gravity Base Structure with a gravel bed foundation; and
- Alternating current (AC) Inter-array cabling of a voltage between 33-66 kV.

Overall, consent is being sought to construct up to a maximum total capacity of 1,500 MW across the three sites. Consent has already been granted for a meteorological mast to be installed within the EDA during 2012. Plans to install a second meteorological mast within the EDA are incorporated within this assessment although the location of the installation is currently unknown.

A summary of the offshore transmission infrastructure that would be required for the offshore connections is provided below.

- Six AC collector Offshore Substation Platforms (OSPs);
- Two Direct Current (DC) converter OSFs;
- AC OSP connector cabling of a voltage of 220 kV; and
- Two bundles of DC export cabling of a voltage of 320 kV.
- The substructures and foundations for the OSFs include:
 - Jackets with pin piles;
 - Jacket with suction caissons;
 - Jack-up with pin piles;
 - Jack-up with suction caissons; and
 - Gravity Base Structures with gravel bed foundation.

1.2.1 Cumulative effects

In addition to assessing the potential effects of the proposed MORL wind farms (Telford, Stevenson and MacColl), an assessment of the potential cumulative effects upon marine mammals arising from other existing or reasonably foreseeable marine and coastal developments and activities within the Moray Firth is presented.

The developments and activities considered within the cumulative impact assessment are listed in Section 5.1. The geographical scope of the cumulative assessment is principally focused in the Moray Firth area. It is,

however, recognised that some mobile species may spend varying periods of time outside the Moray Firth and, as a result, there is potential for these to be affected by other activities/developments further afield.

2. Legislation

Article 6 of the Habitats Directive states that the competent authority must consider whether a proposed project has the potential to have adverse effects on the integrity of Natura 2000 European sites. The process to assess this is referred to as the Habitat Regulation Appraisal (HRA).

The HRA process has four stages (Defra, 2010):

- Stage 1 - Screening: Identify the likely effects of a project upon a Natura 2000 site, either alone or in combination with other projects or plans, and consider whether these effects may be significant. The burden of evidence is to show, on the basis of objective information, that there will be no significant effect. If the effect may be significant, or is not known, an Appropriate Assessment (AA) is required;
- Stage 2 - Appropriate Assessment: the detailed consideration of the potential effects identified in Stage 1 to establish whether there is any impact on the integrity of Natura 2000 sites, either alone or in combination with other projects or plans, with respect to the Natura 2000 site's conservation objectives, its structure and function. The intention of this process is to determine whether there is objective evidence that adverse effects on the integrity of the site can be excluded. This stage also includes the development of mitigation measures to avoid or reduce any possible effects;
- Stage 3 – Assessment of alternatives: alternative ways of achieving the project objectives that would avoid adverse effects on the integrity of the Natura 2000 site, should avoidance or mitigation measures be unable to sufficiently reduce adverse effects; and
- Stage 4: Assessment with regard to whether or not the project is necessary for imperative reasons of overriding public interest (IROPI) and, if so, of the compensatory measures needed to maintain the overall coherence of the Natura 2000 network.

The information provided in Technical Appendix 4.4 A: Baseline Marine Mammals is considered within this appraisal in the context of background information contributing site selection for the HRA process.

Technical Reports 7.3 A-F detail potential impacts resulting from the Project (three proposed wind farms and associated TI) and the methodologies used to investigate their effects. These reports are used to inform on the potential effects the proposed developments may have on the integrity of Natura 2000 sites, contributing to Stages 1 and 2 of the HRA process.

3. Protected Areas for Appraisal

To date, 14 species of cetaceans have been recorded within the Moray Firth, and the area contains breeding populations of two species of pinniped. Of these species, four are listed on Annex II of the Habitats Directive and require the designation of Special Areas of Conservation (SAC). These species are the harbour seal, grey seal, bottlenose dolphin and harbour porpoise.

To date, the UK has designated only two SACs for the bottlenose dolphin; one in Cardigan Bay, Wales and the other within the Moray Firth. The Moray Firth SAC was accepted by the European Commission in October 1996 and comprises of a “triangular” area of water extending from the inner firths to Helmsdale on the northern coast and Lossiemouth on the southern coast, including the Beauty/Inverness Firths, and the outer reaches of the Dornoch and Cromarty Firths.

There are presently 12 UK SACs for which grey seal are the primary or a qualifying feature and 11 for harbour seal. Of these, only one occurs within the Moray Firth – the Dornoch Firth and Morrich More SAC designated for harbour seals. This site was designated by Scottish Ministers as a SAC in 2005. The marine component of the Dornoch Firth and Morrich More SAC extends from Bonar Bridge to the mouth of the estuary between Dornoch Point on the north shore and to the west of Portmahomack on the south shore.

Tagging and observational studies on harbour seal populations suggests they are faithful to their haul-out sites, and remain relatively close (<100 km) when foraging. The closest harbour seal SAC outside of the Moray Firth is the Firth of Tay and Eden Estuary SAC and there is no evidence to suggest harbour seals from this area travel to the Moray Firth when foraging.

Although no SACs designated for grey seal occur within the Moray Firth, tracking studies have shown the seals tagged at other SACs travel to the Moray Firth to forage. These sites include the Berwickshire and north Northumberland coast SAC; Faray and Holm of Faray SAC, Orkney; and the Isle of May.

No SACs have yet been designated for harbour porpoise within UK waters, but the JNCC and country agencies are in the process of analysing distribution data to determine whether any suitable sites can be defined.

Consultation with SNH and JNCC in March 2012, after the submission of the draft ES, suggested that the Natura 2000 sites to be considered with respect to HRA and the Project are the Moray Firth SAC and the Dornoch Firth and Morrich More SAC.

Based on advice received from SNH, grey seals from haul-out sites outside of the Moray Firth are primarily considered to be “temporary” visitors to the Moray Firth. It was therefore not necessary to consider connectivity between activities within the Moray Firth and Natural 2000 sites for grey seals outside (i.e. those identified above). Therefore, no such sites will be considered within this assessment.

The conservation objectives for the two sites under consideration are:

- 1) To avoid deterioration of the qualifying habitats thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.

To ensure for the qualifying habitats that the following are maintained in the long term:

- Extent of the habitat on site;
- Distribution of the habitat within site;
- Structure and function of the habitat;
- Processes supporting the habitat;
- Distribution of typical species of the habitat;
- Viability of typical species as components of the habitat; and
- No significant disturbance of typical species of the habitat.

- 2) To avoid deterioration of the habitats of qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying interests.

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site;
- Distribution of the species within site;
- Distribution and extent of habitats supporting the species;
- Structure, function and supporting processes of habitats supporting the species; and
- No significant disturbance of the species.

4. Screening of project

The purpose of the screening stage is to:

- a) Identify all aspects of the plan which would not be likely to have a significant effect on a European site, either alone or in combination with other aspects of the same plan or other plans or projects, so that they can be eliminated from further consideration; and
- b) Identify those aspects of the plan where it is not possible to rule out the risk of significant effects on a European site, and thereby provide a clear scope for the parts of the plan that will require 'appropriate assessment' (SNH, 2010).

The information provided here is a summary of the information provided in Technical Appendix 7.3 A: Marine Mammal Impact Assessment. This report provides details of potential effects associated with the Project and methodologies used to assess these potential effects. Table 4.1 below presents definitions of some of the terminology used in these impact assessments (see Technical Appendix 7.3 A for full details).

Table 4.1: Summary of definitions used in impact assessment.

Magnitude	Duration		
	Short term (days)	Medium term (construction years)	Long term (25yrs)
High (>20%) of population	Major significance (short term)	Major significance (medium term)	Major significance (long term)
Medium (>10%)	Minor significance (short term)	Medium significance (medium term)	Medium significance (long term)
Low (<10%)	Negligible significance	Minor significance (medium term)	Minor significance (long term)

Of the 16 marine mammal species identified in Technical Report 4.4 A: Baseline Marine Mammals, five species were highlighted as being the most abundant and therefore became the focus of the impact assessment. These species were:

- Harbour porpoise
- Bottlenose dolphin
- Minke whale
- Harbour seal
- Grey seal.

Assessments made regarding harbour seal and bottlenose dolphin will form the focus of this appraisal. A summary of the impact assessments for these species discussed in relation to the Project can be found in Table 4.2 below. The cumulative impacts with other proposed developments within the Moray Firth (primarily the neighbouring Beatrice Offshore Wind Farm (BOWL)) are also included.

Table 4.2: Summary of predicted impacts associated with the Project and other developments within the Moray Firth.

Potential Effect	Predicted effect	Duration
Construction Phase		
Increased anthropogenic noise from construction activities other than piling	Low significance	Moderate duration
Increased anthropogenic noise from piling resulting in behavioural displacement	Medium to major significance	Moderate duration
Collision risk from construction traffic	Low significance	Moderate duration
Use of ducted propellers	Low significance	Moderate duration
Reduced prey sources (due to noise from construction activities)	Minor significance	Moderate duration
Reduced foraging ability as a result of increased turbidity associated with construction activities	Low significance	Moderate duration
Operational Phase		
Turbine operating noise	Not significant	Long duration
Collision risk associated with maintenance vessels	Low significance	Long duration
Use of ducted propellers	Not significance	Long duration
Habitat loss resulting in reduced prey availability	Not significant	Long duration
Electromagnetic fields effecting navigation	Not significant	Long duration
Heavy metal contamination from sacrificial anodes and antifouling paints	Not significant	Long duration

Cumulative impacts		
Increased anthropogenic noise from construction activities other than piling	Low significance	Moderate duration
Increased noise from piling on MORL and BOWL site resulting in behavioural displacement	Medium to major significance	Moderate duration
Increased risk of collision with vessels associated with multiple developments	Low significance	Moderate duration
Habitat loss resulting in reduced prey availability	Not significant	Long duration

Noise produced during the piling of turbine and offshore substation platforms (OSPs) foundations resulting in behavioural displacement (highlighted in blue in Table 4.2) is the one potential effect identified as having the potential to have a temporary but major significant effect on the harbour seal and bottlenose dolphin populations within the Moray Firth.

In order to predict the number of harbour seals and bottlenose dolphins displaced, upper, lower and best fit estimates for the relationship between the probability of displacement and received noise levels were used (see Technical Appendix 7.3 B: Seal assessment framework for more details). The impact assessments summarised above in Table 4.2 are based on the outputs from the most precautionary models.

Greater than 20% of the harbour seal population were predicted to be displaced as a result of piling noise at the three proposed wind farm sites, with predictions for bottlenose dolphins slightly lower (10-20%) (see Technical Appendix 7.3 A for details). For the harbour seal population, the effects of this displacement were considered to be of major significance in the medium term. For the bottlenose dolphin population, the effects of displacement were considered to be of medium to major significance in the medium term. The “best fit” models produced lower predicted values of displacement for both populations although in the case of the harbour seal, the predicted levels of displacement are still greater than 20% and therefore of major significance based on the definitions used in the assessment (see Technical Appendix 7.3 A for full results).

To investigate the long term effects of piling noise, population modelling was conducted on both populations (see Technical Report 7.3 A for methodology and full results). A period of 25 years was chosen for the modelling as it represented the predicted life span of the proposed developments and is in line with published data on marine mammal expectancies (see Technical Appendix 7.3 B: Seal Assessment Framework).

For harbour seals, a deterministic stage-based matrix model previously used to estimate the impacts of shooting seals was adapted (Thompson *et al.*, 2007), enabling potential changes in reproductive output and mortality specific to certain age-classes or sex to be explored. The model also allows the incorporation of cumulative impacts, for example, if licenses to shoot seals within the Moray Firth are granted (see Technical Appendix 7.3 B: Seal assessment framework for details). Models compared potential impact scenarios with a baseline model, and were run using upper, lower and best fit estimates for the relationship between the probability of displacement and received noise levels. The baseline model used the most recently available data on abundance, reproduction and survival of harbour seals in the Moray Firth, which suggest that the population is currently recovering.

The bottlenose dolphin model used a stochastic individual-based model previously used to compare management strategies for the Moray Firth bottlenose dolphin population (Thompson *et al.*, 2000). This uses available literature values for bottlenose dolphin demographic and life-history parameters in the programme VORTEX to produce a baseline model with a stable population growth rate, against which disturbance scenarios are compared. The use of a baseline model with stable population growth is in accordance with the most recent data on the status of bottlenose dolphins on the East coast of Scotland which suggest that the population is either stable or increasing.

The matrix model for the harbour seal population suggested that, while worst case scenarios could lead to a small decline in abundance during the construction period, the population should recover within a few years of the wind farms being completed and there would be no long term impact on the integrity of the population.

The scenarios for bottlenose dolphins were compared against a model that assumes that population growth is, on average, stable. Bottlenose dolphin models were run 100 times for each scenario (baseline scenario run 1000 times), with the frequency distribution of final population sizes presented. In all cases, worst case impact scenarios resulted in a similar distribution of final population sizes to baseline models, suggesting that there would be no long term impact on the integrity of the population.

5. Appraisal

The focus of this appraisal is the effects of increased noise from piling. The assessment is divided into three areas:

- 1) Offshore generating stations;
- 2) Offshore transmission infrastructure (OfTI); and
- 3) Cumulative impacts with other proposed developments.

Although a number of proposed cumulative developments have been highlighted within the ES as having possible cumulative impacts on marine mammals, the following developments have been targeted due to their potential use of piling activities and proximity to the Moray Firth:

- Beatrice Offshore Wind Farm (BOWL) and associated infrastructure;
- European Offshore Wind Deployment Centre;
- All Forth and Tay wind projects

5.1 Assessment methodology

Appraisal will be made on whether the following will occur due to the development of the proposed wind farm sites (Telford, MacColl and Stevenson):

- 1) Changes in the distribution or extent of the habitats supporting the species;
- 2) Changes in the structure, function and supporting processes of habitats supporting the species;
- 3) Significant disturbance to the qualifying species;
- 4) Changes in the distribution of the species within the site; and
- 5) The species being maintained as a viable component of the site in the long-term, and therefore the integrity of the site.

Terminology used within this assessment are based on that suggested by the Intergovernmental Panel on Climate Change (IPCC). Definitions provided by the IPCC for levels of confidence in an assessment and the likelihood it will occur can be found in Tables 5.1 and 5.2 below.

Chapters of the ES (and their associated Technical Appendices) that have been taken into consideration when making this appraisal are:

- 2.2: Project description;
- 3.6: Physical environment - underwater noise;
- 4.4: Baseline environment – marine mammals;
- 7.1: Offshore generating station – benthic ecology;
- 7.2: Offshore generating station – fish and shellfish ecology;
- 7.3: Offshore generating station – marine mammals;

- 10.1: Offshore transmission infrastructure – benthic ecology;
- 10.2: Offshore transmission infrastructure – fish and shellfish ecology;
- 10.3: Offshore transmission infrastructure – marine mammals;
- 14.1: Cumulative impact assessment – benthic ecology;
- 14.2: Cumulative impact assessment – fish and shellfish ecology; and
- 14.3: Cumulative impact assessment – marine mammals.

Table 5.1: Quantitatively calibrated levels of confidence used in this assessment as defined by the IPCC.

Terminology	Degree of confidence in being correct
Very high confidence	At least 9 out of 10 chance of being correct
High confidence	About 8 out of 10 chance
Medium confidence	About 5 out of 10 chance
Low confidence	About 2 out of 10 change
Very low confidence	Less than 1 out of 10 chance

Table 5.2: Definition for the likelihood of a defined outcome having occurred or occurring in the future, as defined by the IPCC.

Terminology	Likelihood of occurrence/outcome
Virtually certain	> 99% probability of occurrence
Very likely	>90% probability of occurrence
Likely	>66% probability of occurrence
About as likely as not	33-66% probability of occurrence
Unlikely	<33% probability of occurrence
Very unlikely	<10% probability of occurrence
Exceptionally unlikely	<1% probability of occurrence

Due to the number of conservative assumptions that have been made during the impact assessment for marine mammals, consultation with scientific experts has resulted in an assignation of a **likely** degree of certainty (66-100%

probability) has been assigned to the predictions of displacement, potential to experience PTS onset and population consequences discussed below. The scientific experts involved in the development of the assessment methodology feel the conservative nature of all the assumptions taken result in a substantial cumulative over-prediction of impact. Table 7.3.11 in Chapter 7.3 provides details on the assumptions that have been made during this impact assessment, and why it is felt that they represent the most conservative approach possible in each case.

5.2 Offshore Generating Stations

5.2.1 Moray Firth SAC (bottlenose dolphin)

Table 5.3 below details the appraisals for the bottlenose dolphin population for which the Moray Firth SAC has been designated. This appraisal examines the effects of piling noise from the three proposed wind farm developments (Stevenson, MacColl and Telford).

Table 5.3 Assessment of the Moray Firth SAC per conservation objectives. Confidence levels based on conservative assumptions proposed seal framework assessment (Technical Appendix 7.3 B) and detailed in Table 11 of Chapter 7.3, in addition to a desk top comparison of behavioural responses by harbour porpoise and bottlenose dolphins to noise (Technical Appendix 7.3 D).

Criterion	Assessment
1: Change in habitat distribution	<p>The footprint of the proposed wind farms do not overlap with the Moray Firth SAC. Bottlenose dolphins are primarily encountered within the coastal regions and are not expected to occur within the wind farm area.</p> <p>Chapter 7.1 of the ES predicts negligible to minor effects on benthic habitats within the footprints of the Telford, Stevenson and MacColl farms.</p> <p>Taking into account predictions made in the ES and the fact that the SAC does not fall within the boundaries of the proposed developments, changes to habitat distribution as a result of construction activities are considered to be exceptionally unlikely and not significant on the Moray Firth SAC.</p> <p>Confidence level: very high.</p>
2: Change in habitat structure	<p>Chapter 7.2 of the ES predicts minor effects for the impacts of piling noise or habitat loss from gravity foundations on fish species from the proposed MORL developments.</p> <p>Taking into account predictions made in the ES and the fact that the SAC does not fall within the boundaries of the proposed developments, changes to habitat structure are considered to be exceptionally unlikely and not significant on the Moray Firth SAC.</p> <p>Confidence level: very high.</p>

<p>3: Significant disturbance to species</p>	<p>The primary disturbance to bottlenose dolphins from the proposed developments is increased noise from piling during the construction phase. This disturbance has the potential to cause partial displacement from habitats currently frequented by bottlenose dolphins within the Moray Firth.</p> <p>Levels of displacement predicted by the most precautionary models presented in Chapter 7.3 and in Technical Appendix 7.3 A suggest that for all scenarios investigated for the construction of MacCall, Stevenson and Telford wind farms, less than 12% of dolphins present in the Moray Firth will be suffer behavioural displacement (based on the model of best fit) and 19% for the most precautionary fit.</p> <p>Noise propagation models (see Technical Report 7.3 F) suggest that sound levels from piling at the southern Moray Firth (which is commonly used by bottlenose dolphins), will be approximately 70 dB_{ht}. Using the noise dose response curve from harbour porpoise behaviour described in Chapter 7.3 and in detailed within Technical Appendix 7.3 A as a proxy for bottlenose dolphin, 70 dB_{ht} equates to between 20% (best fit) and 40% (conservative fit) displacement . Noise levels in the inner Moray Firth will be even lower.</p> <p>As described in Technical Appendix 7.3 D, analysis of available data indicates higher level responses by harbour porpoises than bottlenose dolphins to similar noise levels. Thus, using harbour porpoise as a proxy for bottlenose dolphin is likely to produce an overestimation of associated effect upon the bottlenose dolphin population.</p> <p>The modelling presented in Technical Report 7.3 A and summarised in Chapter 7.3 assumes piling will occur consistently across the construction period. In practice there will be gaps in piling operations, either from operational constraints (i.e. when re-positioning vessels) or during periods of bad weather, thus providing periods without the risk of disturbance.</p> <p>Taking all of this into account, it is considered that any disturbance from piling noise on the bottlenose dolphin population will be likely but temporary in nature (i.e. only for the duration of the piling activities) and of minor significance in the long term.</p> <p>Confidence level: high</p>
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<p>4: Change in species distribution</p>	<p>Many of the foraging areas used by the bottlenose dolphin population occur outside of the boundaries of the SAC and research has confirmed that individuals regularly leave the Moray Firth and spend time in other areas along the eastern coast (see Technical Report 4.4 A: Baseline Marine Mammals).</p> <p>Noise propagation and impact modelling presented in Technical Appendix 7.3 A, along with the comparison of behavioural responses by harbour porpoises and bottlenose dolphin to noise presented in Technical Appendix 7.3 D, suggests that while noise levels in coastal waters from piling activities within the three MORL sites are predicted to elicit a response, and may lead to low levels of displacement, they will not prevent movement by bottlenose dolphins along the southern coast of the Moray Firth.</p> <p>It is therefore considered that changes in species distribution are unlikely and if they were to occur, would be temporary in nature (i.e. only for the duration of piling activities). The overall impact of piling noise on species distribution is considered to be of minor significance in the long term.</p> <p>Confidence level: high</p>
<p>5: Species maintained as viable component</p>	<p>The population modelling described in Technical Appendix 7.3 A predicts the abundance of bottlenose dolphins within the Moray Firth over a 25 year period, including years of presumed disturbance. Outputs from the most precautionary models for the scenario in which most noise is generated¹, indicate that the final distribution of population sizes is similar to baseline scenarios, even with a period of disturbance.</p> <p>Therefore it is predicted that the long-term viability of the bottlenose dolphin population will not be affected by construction activities and the potential effects from piling noise on the population as a viable component of the SAC are unlikely and of minor significance.</p> <p>Confidence level: high</p>

5.2.2 Dornoch Firth and Morrich More SAC (harbour seal)

Table 5.4 below details the appraisal of predicted piling noise on the harbour seal population for which the Dornoch Firth and Morrich More SAC has been designated. This appraisal examines the effects of piling noise from the three proposed wind farm developments (Stevenson, MacColl and Telford).

¹ Model C: six piling vessels working simultaneously over a two year period; two vessels within each of the proposed MORL sites (Telford, Stevenson and MacColl).

Table 5.4: Assessment of the Dornoch Firth and Morrich More SAC per conservation objectives. Confidence levels based on conservative assumptions proposed seal framework assessment (Technical Appendix 7.3 B) and detailed in Table 11 of Chapter 7.3.

Criterion	Assessment
<p>1: Change in habitat distribution</p>	<p>Chapter 7.1 of the ES predicts negligible to minor effects on benthic habitats within the footprints of the proposed Telford, Stevenson, MacColl wind farms.</p> <p>The footprint of the proposed wind farms do not overlap with the SAC, but do represent part of the harbour seal foraging range. Taking into account predictions made in the ES, changes to habitat distribution (either within the SAC or in preferred foraging areas within the Moray Firth) as a result of piling activities are considered to be unlikely and not significant for the Dornoch Firth and Morrich More SAC.</p> <p>Confidence level: high.</p>
<p>2: Change in habitat structure</p>	<p>Chapter 7.2 of the ES predicts minor effects for the cumulative impacts of piling noise or habitat loss from gravity foundations on fish species from the proposed MORL developments.</p> <p>The footprint of the proposed wind farms do not overlap with the SAC but do represent part of the harbour seal foraging range. Taking into account predictions made in the ES, changes to habitat structure as a result of piling noise (either within the SAC or in preferred foraging areas within the Moray Firth) are considered to be unlikely and not significant for harbour seal.</p> <p>Confidence level: high.</p>

Criterion	Assessment
<p>3: Significant disturbance to species</p>	<p>The primary disturbance to harbour seals from the proposed developments is considered to be increased noise from piling during the construction phase. This disturbance has the potential to cause displacement from habitats currently frequented by harbour seals within the Moray Firth.</p> <p>Noise propagation modelling suggests that noise levels from piling will be low in the inner Moray Firth and the Dornoch Firth and Morrich More SAC. Given the distance between the proposed developments and haul-out sites within the SAC (>50 km), disturbance to seals hauled-out are considered to be unlikely.</p> <p>As shown in Chapter 4.4: Baseline Environment - Marine Mammals, the footprint of the proposed wind farms represents part of the harbour seal foraging range and it is here that the greatest level of disturbance has the potential to occur.</p> <p>Modelling presented in Technical Appendix 7.3 A, and summarised in Chapter 7.3, predict that between 44-66% of the population may be displaced as a result of piling noise based on the models of best fit. This proportion rises to 62-72% if the most precautionary data fit from the porpoise noise dose response curve is used.</p> <p>The modelling presented in Technical Appendix 7.3 A assumes piling will occur consistently across the construction period. In practice it is expected there will be gaps in piling operations, either from operational constraints (i.e. when re-positioning vessels) or during periods of bad weather, which will provide periods during which seals can forage within the wind farms footprints. Modelling the proportion of the population to be excluded for the full duration of the construction period therefore represents a very precautionary approach.</p> <p>It is considered that some harbour seals from this population are likely to experience major significant disturbance while foraging during the piling operations. This impact is not expected to extend for prolonged periods once piling temporarily ceases. The effects of this disturbance are considered to be temporary (i.e. the duration of piling activities) and of minor significance to the population long term.</p> <p>Confidence level: high.</p>

Criterion	Assessment
<p>4: Change in species distribution</p>	<p>Annual haul-out surveys over the last 25 years have demonstrated that there have been natural changes in the distribution of harbour seals at different haul-out sites across the Moray Firth (Thompson et al. 1996), including changes in the relative importance of sites within the SAC (Cordes et al., 2011). Tagging studies have also shown that foraging areas for harbour seals from Moray Firth haul-out sites are not within the boundaries of the SAC (Cordes et al., 2011). The footprint of the proposed wind farms covers part of the harbour seals' potential foraging area (Smith Bank), and the most precautionary models presented in Technical Appendix 7.3 A predict that between 62-72% of the population may be displaced as a result of piling noise. The duration of this displacement is unknown, but it is expected to be temporary by scientific experts, and forthcoming data from DECC funded studies in the Wash can be used to test these assumptions.</p> <p>Displaced seals are likely to use alternative foraging areas within the Moray Firth where there are lower levels of disturbance. This would represent a potential temporary change in their distribution within the waters of the Moray Firth. As seen during periods of natural changes in prey availability, these changes may also lead to temporary changes in the use of different Moray Firth haul-out sites (Thompson et al. 1996). Given the distance between the proposed developments and haul-out sites within the SAC (>50 km), it is considered unlikely that haul-out sites will be directly disturbed from piling noise and therefore changes in haul-out distribution as a direct result of piling noise are considered unlikely, although indirect changes linked with changes in foraging patterns may occur.</p> <p>Population modelling (described in Technical Appendices 7.3 A, 7.3 B and summarised in Chapter 7.3) suggests while population levels may decrease during the construction period, the population is predicted to recover once construction is completed. Taking all of this into account, it is suggested that changes in distribution of harbour seals associated with piling noise within the Moray Firth are likely but temporary in nature (i.e. duration of piling activities) and of minor significance.</p> <p>Confidence level: high</p>

Criterion	Assessment
<p>5: Species maintained as viable component of SAC</p>	<p>The population modelling described in Technical Appendix 7.3 A, and summarised in Chapter 7.3, predicts the abundance of harbour seals within the Moray Firth for each year over a 25 year period, including those years in which disturbance is predicted to occur. These projections indicate that population levels will decrease by less than 10%, even for the most precautionary models and the scenario in which disturbance is greatest². All scenarios suggest that the population will recover quickly over subsequent years, and there will be no long-term difference between impact and baseline scenarios.</p> <p>It is predicted that the long-term viability of the harbour seal population will not be affected by construction activities, and potential effects from piling noise on the population as a viable component of the SAC are unlikely and of minor significance in the long term.</p> <p>Confidence level: high</p>

² Model C: six piling vessels working simultaneously over a two year period; two vessels within each of the proposed MORL sites (Telford, Stevenson and MacColl).

5.3 OfTI Route

5.3.1 Moray Firth SAC (bottlenose dolphin)

Table 5.5 below details the appraisals for the bottlenose dolphin population for which the Moray Firth SAC has been designated. This appraisal examines the effects of piling noise from the installation of OSPs as part of the offshore transmission infrastructure (OfTI) for the three proposed wind farm developments (Stevenson, MacColl and Telford).

Table 5.5 Assessment of the Moray Firth SAC per conservation objectives. Confidence levels based on conservative assumptions proposed seal framework assessment (Technical Appendix 7.3 B) and detailed in Table 11 of Chapter 7.3, in addition to a desk top comparison of behavioural responses by harbour porpoise and bottlenose dolphins to noise (Technical Appendix 7.3 D).

Criterion	Assessment
1: Change in habitat distribution	<p>The OfTI for the proposed wind farms involves the installation of up to eight OSPs, the foundations of which may require piling. The exact locations of the OSPs have yet to be decided but they will be in the general areas of the proposed wind farm sites and therefore will not overlap with the Moray Firth SAC. Bottlenose dolphins are primarily encountered within the coastal regions and thus not expected to occur within the wind farm area.</p> <p>Chapter 10.1 of the ES predicts negligible to minor effects on benthic habitats within the footprints of the OfTI.</p> <p>Taking into account predictions made in the ES and the fact that the SAC does not fall within the boundaries of the proposed development, changes to habitat distribution as a result of construction activities are considered to be exceptionally unlikely and not significant on the Moray Firth SAC.</p> <p>Confidence level: very high.</p>
2: Change in habitat structure	<p>Chapter 10.2 of the ES predicts minor effects for the impacts of piling noise on fish species from the OfTI associated with proposed MORL developments.</p> <p>Taking into account predictions made in the ES and the fact that the SAC does not fall within the boundaries of the proposed developments, changes to habitat structure are considered to be exceptionally unlikely and not significant on the Moray Firth SAC.</p> <p>Confidence level: very high.</p>

<p>3: Significant disturbance to species</p>	<p>The primary disturbance to bottlenose dolphins from the proposed developments is considered to be increased noise from piling during the construction phase. This disturbance has the potential to cause displacement from habitats currently frequented by bottlenose dolphins within the Moray Firth.</p> <p>The locations of OSPs will not overlap with the Moray Firth SAC and bottlenose dolphins are primarily encountered within coastal regions and thus not expected to occur within the vicinity of the OSPs.</p> <p>Levels of displacement predicted by the most precautionary models presented in Technical Appendix 7.3 A and presented Chapter 10.3 suggest that less than 9% of the population will be displaced (based on the model of best fit) for the month of piling activity related to the OSP foundation installation each year. This proportion rises to 14% if the most precautionary model is used for behavioural response to piling noise.</p> <p>Noise propagation models (see Technical Report 7.3 F) suggest sound levels at the southern Moray Firth (which is commonly used by bottlenose dolphins), will be approximately 70 dB_{ht}. Using the noise dose response curve described Chapter 10.3 and in detailed within Technical Appendix 7.3 A, 70 dB_{ht} equates to between 20% (best fit) and 40% (conservative fit) displacement . Noise levels in the inner Moray Firth will be even lower.</p> <p>As described in Technical Appendix 7.3 D, analysis of available data indicates higher level responses by harbour porpoises than bottlenose dolphins to similar noise levels. Thus, using harbour porpoise as a proxy for bottlenose dolphin is likely to produce an overestimation of associated effect upon the bottlenose dolphin population.</p> <p>The modelling presented in Technical Report 7.3 A and summarised in Chapter 10.3 assumes piling will occur consistently across the construction period. In practice there will be gaps in piling operations, either from operational constraints (i.e. when re-positioning vessels) or during periods of bad weather, thus providing periods without the risk of disturbance.</p> <p>Taking all of this into account, it is considered that any disturbance from piling noise on the bottlenose dolphin population will be likely but temporary in nature (i.e. only for the duration of the piling activities) and of minor significance in the long term.</p> <p>Confidence level: high</p>
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<p>4: Change in species distribution</p>	<p>Many of the foraging areas preferred by the bottlenose dolphin population occur outside of the boundaries of the SAC and research has confirmed that individuals regularly leave the Moray Firth and spend time in other areas along the eastern coast (see Technical Report 4.4 A: Baseline Marine Mammals).</p> <p>Noise propagation and impact modelling presented in Technical Appendix 7.3 A and summarised Chapter 10.3 suggests that while noise levels in coastal waters from piling activities within the proposed developments are predicted to elicit a response, and may lead to low levels of displacement, they will not prevent movement by bottlenose dolphins along the southern coast of the Moray Firth.</p> <p>It is therefore considered that changes in species distribution are unlikely and if they were to occur, would be temporary in nature (i.e. only for the duration of piling activities). The overall impact of piling noise on species distribution is considered to be of minor significance in the long term.</p> <p>Confidence level: high</p>
<p>5: Species maintained as viable component</p>	<p>The population modelling described in Technical Appendix 7.3 A and summarised in Chapter 7.3 predicts the abundance of bottlenose dolphins within the Moray Firth over a 25 year period, including years of presumed disturbance from the wind farm construction. Although population modelling for the consequences of disturbance relating to the OSP construction activity has not been undertaken, analysis of the outputs described in Chapter 10.3 suggests that, based on the most precautionary model for OSPs, population levels will be similar to baseline scenarios over the 25 year period, even with a period of disturbance relating to OSP installation.</p> <p>Therefore it is predicted that the long-term viability of the bottlenose dolphin population is robust, and the potential effects from piling noise from OSP installation on the population as a viable component of the SAC are unlikely and of minor significance.</p> <p>Confidence level: high</p>

5.3.2 Dornoch Firth and Morrich More SAC (harbour seal)

Table 5.6 below details the appraisal of predicted piling noise on the harbour seal population for which the Dornoch Firth and Morrich More SAC has been designated. This appraisal examines the effects of piling noise from the installation of OSPs as part of the OfTI for the three proposed wind farm developments (Stevenson, MacColl and Telford).

Table 5.6: Assessment of the Dornoch Firth and Morrich More SAC per conservation objectives. Confidence levels based on conservative assumptions proposed seal framework assessment (Technical Appendix 7.3 B) and detailed in Table 11 of Chapter 7.3.

Criterion	Assessment
<p>1: Change in habitat distribution</p>	<p>The OfTI for the proposed wind farms involves the installation of eight OSPs, the foundations of which may require piling. The exact locations of the OSPs have yet to be decided but they will be in the general area of the proposed wind farm sites and therefore will not overlap with the Dornoch Firth and Morrich More SAC.</p> <p>Chapter 10.1 of the ES predicts negligible to minor impacts on benthic habitats within the footprints of the proposed Telford, Stevenson, MacColl wind farms and their associated transmission structure.</p> <p>Although the footprint of the proposed OSPs and transmission cables do not overlap with the SAC, they do represent part of the harbour seal foraging range. Taking into account predictions made in the ES, changes to habitat distribution (either within the SAC or in preferred foraging areas within the Moray Firth) as a result of piling activities and cable burial are considered to be unlikely and not significant for the Dornoch Firth and Morrich More SAC.</p> <p>Confidence level: high.</p>
<p>2: Change in habitat structure</p>	<p>Chapter 10.2 of the ES predicts minor effects for the cumulative impacts of piling noise on fish species from the OfTI associate with the proposed MORL developments.</p> <p>The footprint of the proposed OSPs and transmission cables do not overlap with the SAC but do represent part of the harbour seal foraging range. Taking into account predictions made in the ES, changes to habitat structure as a result of piling noise (either within the SAC or in preferred foraging areas within the Moray Firth) are considered to be unlikely and not significant for the Dornoch Forth and Morrich More SAC.</p> <p>Confidence level: high.</p>

3: Significant disturbance to species

The primary disturbance to harbour seals from the proposed OSP installation is considered to be increased noise from piling during the construction phase. This disturbance has the potential to cause displacement from habitats currently frequented by harbour seals within the Moray Firth and the Dornoch Firth and Morrich More SAC.

Noise propagation modelling suggests that noise levels from piling will be relatively low in the inner Moray Firth. Given the distance between the proposed developments and haul-out sites within the SAC (>50 km), disturbance to seals hauled-out are considered to be **unlikely**.

As shown in Chapter 4.4: Baseline Environment - Marine Mammals, the footprint of the proposed wind farms (in which the OSPs are likely to be located) represents part of the harbour seal foraging range and it is here that the greatest level of disturbance has the potential to occur.

Modelling presented in Technical Appendix 7.3 A and presented in Chapter 10.3 predict that between 39% of the population may be displaced as a result of piling noise based on the model of best fit (55% most precautionary fit). The modelling presented in Technical Appendix 7.3 A assumes piling will occur periodically across the construction period. While it is expected that the OSPs will require larger pin piles to secure the foundations than the wind turbines (which will potentially create more noise), the small number of platforms required means that in practice their installation will not cause a significant addition to the construction noise from the wind farm site. In addition, it is expected there will be gaps in piling operations, either from operational constraints (i.e. when re-positioning vessels) or during periods of bad weather, thus providing periods in which seals can forage within the wind farm footprint.

It is considered that some harbour seals are **likely** to experience **major significant** disturbance while foraging during the piling operations. This impact is not expected to extend for prolonged periods once piling temporarily ceases. The effects of this disturbance are considered to be **temporary** (i.e. the duration of piling activities) and of **minor significance** to the population long term.

Confidence level: high.

<p>4: Change in species distribution</p>	<p>Annual haul-out surveys over the last 25 years have demonstrated that there have been natural changes in the distribution of harbour seals at different haul-out sites across the Moray Firth (Thompson <i>et al.</i> 1996), including changes in the relative importance of sites within the SAC (Cordes <i>et al.</i>, 2011). Tagging studies have also shown that foraging areas for harbour seals from Moray Firth haul-out sites are not within the boundaries of the SAC (Cordes <i>et al.</i>, 2011). The footprint of the proposed wind farms covers part of the harbour seals' potential foraging area (Smith Bank), and the most precautionary models presented in Chapter 10.3 predict that 55% of the population may be displaced as a result of piling noise. The duration of this displacement is unknown, but it is expected to be temporary by scientific experts, and forthcoming data from DECC funded studies in the Wash can be used to test these hypotheses.</p> <p>Displaced seals are likely to use alternative foraging areas within the Moray Firth where there are lower levels of disturbance. This would represent a potential temporary change in their distribution within the waters of the Moray Firth. As seen during periods of natural changes in prey availability, these changes may also lead to temporary changes in the use of different Moray Firth haul-out sites (Thompson <i>et al.</i>, 1996). Given the distance between the proposed OSPs and haul-out sites within the SAC (>50 km), it is considered unlikely that haul-out sites will be directly disturbed from piling noise from the OSPs and therefore changes in haul-out distribution as a direct result of piling noise are considered unlikely, although indirect changes linked with changes in foraging patterns may occur.</p> <p>Population modelling suggests while population levels may show a minor decrease during the OSP construction period, they are predicted to recover once construction is completed. Taking all of this into account, it is suggested that changes in distribution of harbour seals associated with OSP piling noise within the Moray Firth are likely but temporary in nature (i.e. for the duration of piling activities) and of minor significance.</p> <p>Confidence level: high</p>
<p>5: Species maintained as viable component of SAC</p>	<p>The population modelling described in Technical Appendix 7.3 A and summarised Chapter 10.3 predicts the abundance of harbour seals within the Moray Firth for each year over a 25 year period, including those years in which disturbance is predicted to occur. Analysis of these outputs suggests that population levels will decrease by less than 5% based on the most precautionary model for OSPs, with the population recovering quickly over subsequent years.</p> <p>It is predicted that the long-term viability of the harbour seal population is robust and the potential effects from piling noise on the population as a viable component of the SAC are unlikely and of minor significance in the long term.</p> <p>Confidence level: high</p>

5.4 Cumulative effects

5.4.1 Moray Firth SAC (bottlenose dolphin)

Table 5.7 below details the appraisals for the bottlenose dolphin population for which the Moray Firth SAC has been designated. This appraisal includes the cumulative effects of piling noise from the neighbouring BOWL development in addition to that from the Project. As no details of Rochdale Envelope parameters or construction methodology are available for the Firths of Forth and Tay proposals, a qualitative (rather than quantitative) assessment has been undertaken.

The European Offshore Wind Deployment Centre (EOWDC) is scheduled for construction in 2013-2014, and thus will not constitute a cumulative effect to the Project (which is scheduled to be constructed from 2016-2020). It is therefore not included further within this assessment.

Table 5.7 Assessment of the Moray Firth SAC per conservation objectives. Confidence levels based on conservative assumptions proposed seal framework assessment (Technical Appendix 7.3 B) and detailed in Table 11 of Chapter 7.3, in addition to a desk top comparison of behavioural responses by harbour porpoise and bottlenose dolphins to noise (Technical Appendix 7.3 D).

Criterion	Assessment
1: Change in habitat distribution	<p>The footprint of the Project do not overlap with the Moray Firth SAC. Bottlenose dolphins are primarily encountered within the coastal regions and thus not expected to occur within the wind farm areas.</p> <p>Chapter 14.1 predicts negligible to minor effects on benthic habitats within the footprints of the Telford, Stevenson and MacColl and BOWL farms.</p> <p>Taking into account predictions made in the ES and the fact that the SAC does not fall within the boundaries of the proposed developments, changes to habitat distribution as a result of construction activities are considered to be exceptionally unlikely and not significant on the Moray Firth SAC.</p> <p>Confidence level: very high</p>
2: Change in habitat structure	<p>Chapter 14.2 predicts minor significant effects for piling noise on fish species from the Project and BOWL developments.</p> <p>Taking into account predictions made in the ES and the fact that the SAC does not fall within the boundaries of the Project, changes to habitat structure are considered to be exceptionally unlikely and not significant on the Moray Firth SAC.</p> <p>Confidence level: very high</p>

<p>3: Significant disturbance to species</p>	<p>The primary disturbance to bottlenose dolphins from the Project and BOWL is considered to be from increased noise due to piling during the construction phase. This disturbance has the potential to cause displacement from habitats currently frequented by bottlenose dolphins within the Moray Firth. The locations of wind farms will not overlap with the Moray Firth SAC and bottlenose dolphins are primarily encountered within coastal regions and thus not expected to occur within the vicinity of the three proposed wind farms and BOWL.</p> <p>Levels of displacement predicted by the most precautionary models presented in Technical Appendix 7.3 A and presented in Chapter 14.3 suggest that less than 34% of the dolphins in the Moray Firth will be displaced (based on the model of best fit) by piling activity related to the construction of both the Project and BOWL during 2016-2017 (eight piling vessels). This proportion rises to 42% if the most precautionary model is used for behavioural response to piling noise. If a maximum of two construction vessels are use within the Moray Firth during any one year to build out the MORL and BOWL projects, a maximum of 11% (best fit) or 19% (precautionary fit) of bottlenose dolphin are predicted to be displaced during piling activities.</p> <p>Noise propagation models (see Technical Report 7.3 F) suggest that sound levels from piling at the southern Moray Firth (which is commonly used by bottlenose dolphins), will be approximately 70 dB_{ht}. Using the noise dose response curve from harbour propose behaviour described in Chapter 7.3 and in detailed within Technical Appendix 7.3 A as a proxy for bottlenose dolphin, 70 dB_{ht} equates to between 20% (best fit) and 40% (conservative fit) displacement . Noise levels in the inner Moray Firth will be even lower.</p> <p>As described in Technical Appendix 7.3 D, analysis of available data indicates higher level responses by harbour porpoises than bottlenose dolphins to similar noise levels. Thus, using harbour porpoise as a proxy for bottlenose dolphin is likely to produce an overestimation of associated effect upon the bottlenose dolphin population.</p> <p>The modelling presented in Technical Appendix 7.3 A and summarised in Technical Appendix 7.3 A assumes piling will occur consistently across the construction period. In practice there will be gaps in piling operations, either from operational constraints (i.e. when re-positioning vessels) or during periods of bad weather, thus providing periods without the risk of disturbance.</p> <p>Taking all of this into account, it is considered that any disturbance from piling noise on the bottlenose dolphin population will be likely, moderately significant in the medium term but temporary in nature and of minor significance in the long term.</p> <p>Confidence level: high</p>
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<p>4: Change in species distribution</p>	<p>Many of the foraging areas used by the bottlenose dolphin population occur outside of the boundaries of the SAC and research has confirmed that individuals regularly spend time in areas along the eastern coast (see Technical Appendix 4.4 A: Baseline Marine Mammals).</p> <p>Noise propagation and impact modelling presented in Technical Appendix 7.3 A suggests that while noise levels in coastal waters from piling activities within the proposed developments are predicted to elicit a response and may lead to low levels of displacement, they will not prevent movement by bottlenose dolphins along the southern coast of the Moray Firth.</p> <p>Given the large area that the population is known to inhabit, their distribution has the potential to be affected not only by proposed developments within the Moray Firth but also those proposed along the eastern coast. There is liable to be overlap between construction activities in the Moray Firth and in the Firths of Forth and Tay. Precise details of construction activities in the Forth and Tay area are not presently available but it is likely they will involve piling. No data has been published on the potential effects of piling within the Forth and Tay area but given the proximity of some of the developments to the coast, levels of displacement from the area are possible.</p> <p>It is therefore considered that changes in species distribution within the SAC as a result from the Project and BOWL construction activities are unlikely and if they were to occur, would be temporary in nature (i.e. only for the duration of piling activities). The overall effect of piling noise on species distribution is considered to be of minor significance in the long term.</p> <p>Confidence level: high</p>
<p>5: Species maintained as viable component</p>	<p>The population modelling described in Technical Appendix 7.3 A and summarised Chapter 14.3 predicts the abundance of bottlenose dolphins within the Moray Firth over a 25 year period, including years of presumed disturbance. Outputs from the most precautionary models for the worst case scenario³, suggest that population levels will remain stable over the 25 year period, even with a period of disturbance resulting from the Project and BOWL construction activities.</p> <p>Therefore it is predicted that the long term viability of the bottlenose dolphin population will not be affected by construction activity, and the potential effects of piling noise on the population as a viable component of the SAC are unlikely and not significant.</p> <p>Confidence level: high</p>

³ Model F: eight piling vessels working simultaneously over a two year period; two vessels within each of the proposed BOWL and MORL sites (Telford, Stevenson and MacColl).

5.5 Dornoch Firth and Morrich More SAC (harbour seal)

Table 5.8 below details the appraisal of predicted piling noise on the harbour seal population for which the Dornoch Firth and Morrich More SAC has been designated. This appraisal includes the cumulative effects of piling noise from the neighbouring BOWL development in addition to that from the Project.

Table 5.8: Assessment of the Dornoch Firth and Morrich More SAC per conservation objectives. Confidence levels based on conservative assumptions proposed seal framework assessment (Technical Appendix 7.3 B) and detailed in Table 11 of Chapter 7.3.

Criterion	Assessment
1: Change in habitat distribution	<p>Chapter 14.1 predicts negligible to minor effects on benthic habitats within the footprints of the proposed Telford, Stevenson, MacColl and BOWL wind farms.</p> <p>The footprint of the Project do not overlap with the SAC but do represent part of the harbour seal foraging range. Taking into account predictions made in the ES, changes to habitat distribution (either within the SAC or in preferred foraging areas within the Moray Firth) as a result of piling activities are considered to be unlikely and not significant for the Dornoch Firth and Morich More SAC.</p> <p>Confidence level: high</p>
2: Change in habitat structure	<p>Chapter 14.2 predicts minor significant effects for the cumulative effects of piling noise on fish species from the Project and BOWL developments.</p> <p>The footprint of the Project does not overlap with the SAC but do represent part of the harbour seal foraging range. Taking into account predictions made in the ES, changes to habitat structure as a result of piling noise (either within the SAC or in preferred foraging areas within the Moray Firth) are considered to be unlikely and not significant for the Dornoch Firth and Morich More SAC.</p> <p>Confidence level: high</p>

3: Significant disturbance to species

The primary disturbance to harbour seals from the Project and BOWL is considered to be increased noise from piling during the construction phase. This disturbance has the potential to cause displacement from some habitats currently frequented by harbour seals within the Moray Firth.

Noise propagation modelling suggests that noise levels from piling will be low the inner Moray Firth and the Dornoch Firth and Morrich More SAC. Given the distance between the proposed developments and haul-out sites within the SAC (>50 km), disturbance to seals hauled-out are considered to be **unlikely**.

As shown in Chapter 4.4: Marine Mammals Baseline, the footprint of the three proposed wind farms and BOWL represents part of the harbour seal foraging range and it is here that the greatest level of disturbance has the potential to occur. Modelling presented in Technical Appendix 7.3 A predict that up to 75% of the population may be displaced from foraging areas as a result of piling noise based on the most precautionary models. The duration of this displacement is unknown, but it is expected to be temporary by scientific experts, and forthcoming data from DECC funded studies in the Wash can be used to test these hypotheses. Nevertheless, in the interim we have used the most conservative assumption that animals are excluded for the whole year.

The modelling presented in Technical Appendix 7.3 A and summarised in Chapter 7.3 assumes piling will occur consistently across the construction period. In practice it is expected there will be gaps in piling operations, either from operational constraints (i.e. when re-positioning vessels) or during periods of bad weather, which will provide periods in which seals can forage within the wind farms footprints. Modelling the proportion of the population to be excluded for the full duration of the construction period therefore represents a very precautionary approach.

It is considered that some harbour seals from this population are **likely** to experience **significant** disturbance while foraging during the piling operations. This effect is not expected to extend for prolonged periods once piling ceases. The effects of this disturbance are considered to be **temporary** (i.e. the duration of piling activities) and of minor significance to the population long term.

Confidence level: high

<p>4: Change in species distribution</p>	<p>Annual haul-out surveys over the last 25 years have demonstrated that there have been natural changes in the distribution of harbour seals at different haul-out sites across the Moray Firth (Thompson <i>et al.</i>, 1996), including changes in the relative importance of sites within the SAC (Cordes <i>et al.</i>, 2011). Tagging studies have also shown that foraging areas used by harbour seals from Moray Firth haul-out sites are not within the boundaries of the SAC (Cordes <i>et al.</i>, 2011). The footprint of the proposed three wind farms and BOWL covers part of the harbour seals' potential foraging area (Smith Bank), and the most precautionary models presented in Technical Appendix 7.3 A predict that between 62-75% of the population may be displaced as a result of piling noise.</p> <p>Displaced seals are likely to use alternative foraging areas within the Moray Firth where there are lower levels of disturbance. This would represent a potential temporary change in their distribution within the waters of the Moray Firth. As seen during periods of natural changes in prey availability, these changes may also lead to temporary changes in the use of different Moray Firth haul-out sites (Thompson <i>et al.</i>, 1996). Given the distance between the proposed developments and haul-out sites within the SAC (>50 km), it is considered unlikely that haul-out sites will be directly disturbed from piling noise and therefore changes in haul-out distribution as a direct result of piling noise are considered unlikely, although indirect changes linked with changes in foraging patterns may occur.</p> <p>Population modelling (described in Technical Appendices 7.3 A, 7.3 B and summarised in Chapter 7.3) suggests while population levels may decrease during the construction period, the population is predicted to recover once construction is completed. Taking all of this into account, it is suggested that changes in distribution of harbour seals associated with piling noise within the Moray Firth are likely but temporary in nature (i.e. duration of piling activities) and of minor significance.</p> <p>Confidence level: high</p>
<p>5: Species maintained as viable component of SAC</p>	<p>The population modelling described in Technical Appendix 7.3 A and summarised in Chapter 7.3 predicts that the abundance of harbour seals within the Moray Firth for each year over a 25 year period, including those years in which disturbance is predicted to occur. These projections suggest that population levels will decrease by no more than 23% even for the most precautionary models and the worst case scenario, with the population recovering quickly over subsequent years.</p> <p>It is predicted that the long term viability of the harbour seal will not be affected and the likely effects from piling noise of the Project and BOWL on the population as a viable component of the SAC are unlikely and of minor significance in the long term.</p> <p>Confidence level: high</p>

6. References

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